A TREATISE

ON

STEAM HAMMERS,

AS MADE BY

WM. SELLERS & CO.,

1600 Hamilton Street, Philadelphia, U.S.,

MANUFACTURERS OF

MACHINISTS', FOUNDERS', SMITHS', AND BOILER-MAKERS' TOOLS,

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RAILWAY TURNING AND TRANSFER TABLES,

PIVOT BRIDGES, ETC.;

MANUFACTURERS OF THE

MOST IMPROVED FORMS OF INJECTOR BOILER-FEEDERS,

AND

SOLE MANUFACTURERS OF THE SELF-ADJUSTING INJECTOR.

PHILADELPHIA.

1883.

PRINTED BY
J. B. LIPPINCOTT & CO.,
PHILADELPHIA.

STEAM HAMMERS.

SIZES.

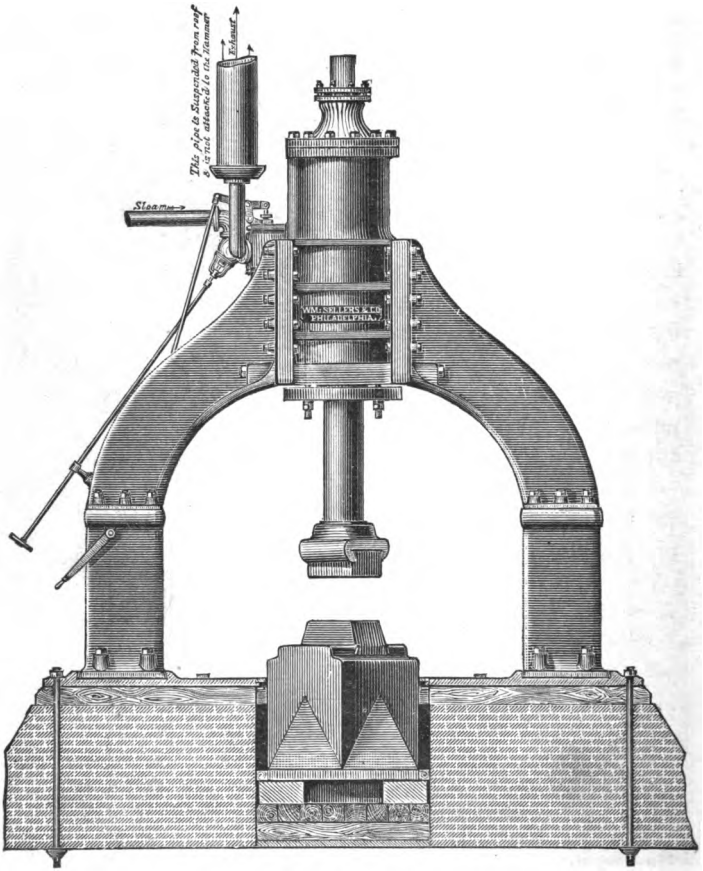
Size or Weight of Hammer Ram.	Length of Stroke.	Height under Frame.	Width between Frames.	Hammer Face.
300 lb.	15½″	SINGLE UPRIGHT.	SINGLE UPRIGHT.	6¾″ × 4½″
650 "	18″			8½″ × 5½″
1000 "	20″			9″ × 5¾″
1500 "	23″			10¼″ × 6″
2000 "	27″			11¾″ × 7″
2500 "	31″			13½″ × 9″
1¾ ton.	3′ 2″	6′ 10″	7′ 6″	16½″ × 10″
2¼ "	3′ 6″	7′ 3¾″	8′ ½″	17¾″ × 11″
3 "	3′ 11½″	7′ 10¼″	9′ 2″	19½″ × 12″
4 "	4′ 6½″	8′ 5½″	9′ 8¼″	21¼″ × 13″
5 "	5′	9′ ½″	11′ 3″	22½″ × 14″
6 "	5′ 6″	9′ 8″	12′ 6″	24″ × 14¾″
8 "	6′ 3½″	10′ 8¼″	13′ 8″	26″ × 16″
10 "	7′	11′ 9″	14′ 8″	29½″ × 18″

GENERAL SPECIFICATION.

Piston rod or hammer bar of solid wrought iron, passing through both heads of cylinder; piston head forged solid with piston rod. Hammer head adjustable on lower end of bar; bar prevented from turning by upper cylinder head. Slide valve balanced.

Hammers of 2500 lbs. weight and under have one upright only, are double acting, taking steam above and below the piston, with self-acting valve gear and hand motion operated by the same lever; can be changed at will whilst in operation, thus affording complete control over the length, rapidity, and force of blow; also, enabling

FIG. 1.



DOUBLE UPRIGHT STEAM HAMMER.

the hammer to be used as a vise or squeezer. 1000 lbs. and under have anvil block passing through the base of upright. Hammers of 1500 lbs. and under are provided with a means of throttling the exhaust below the piston, so as to enable the blow to be diminished in intensity without materially decreasing the rapidity of motion. This attachment is of the utmost importance in finishing light work or tilting steel. All hammers over 2500 lbs. weight have double uprights and are hand-working only, taking steam above and below the piston, thereby increasing the force and rapidity of blows.

IN our introduction into this country of the "Morrison Steam Hammer" we were influenced by what seemed, in our judgment, the practical advantages of his system over all others then known. During the many years we have been making these machines, our attention has been constantly directed towards improving the mode of construction and increasing their durability and efficiency. The essential peculiarities of Mr. Morrison's system were in making the part which strikes the blow—that is, the hammer —of one long bar of wrought iron, having the piston welded to and forming part thereof, and guiding this bar by the top and bottom cylinder heads only, thus doing away with the usual side guides in the hammer frame, leaving the entire space below the cylinder free for the use of the workman in handling his work, whilst the hammer head and die are guided more efficiently than in any other system, and the frames are subjected to less strain.

Solid bar.

No side guides.

These hammers, as first constructed, had a uniform diameter of bar above and below the piston, with an enlargement at the lower end, in which enlarged part the dovetail for holding the dies was planed. The upper end of the bar—*i.e.* the part above the piston —was planed flat on one side, to keep the bar from turning. In practice, it was found that hammers

Flat on top end of bar.

made with this uniform diameter of bar and solid hammer head would in time give out immediately above the enlarged part of the bar at the lower end, because this is the place where the accumulated concussive force is intensified, resulting in some instances in fracture.

Liability to break.

Proceeding on the theoretical idea that in a bar of iron used as a battering ram, the mass of metal forming the ram should increase in sectional area towards the point of impact, we have been led to make the diameter of the piston rod or ram greater below the piston than above it, thus bringing the greatest mass of metal nearest the point of impact, and proportioning the parts so as to be better able to withstand the strain incident to each part.

Increase of bar below piston.

This change, while it made a very decided improvement in the durability of the bar, rendered possible a more important change,—viz., the attaching a loose hammer head, of the requisite size, to the lower cylindrical end of the hammer bar, by means of a circular taper key. Fastening the hammer head by means of this circular key has entirely done away with the possibility of breaking the bar by concussion. As now arranged, the force expends itself at the extreme end of the ram, in contact with the die face, and produces no other result than is attainable by hammering on this part,—*i.e.* on a surface great enough not to be burred up.

Loose hammer head.

Increased durability.

This system of loose head insures the durability of the hammer bar, it also permits the setting of the dovetail in any required position in regard to the anvil block, and admits of a ready repair of the part which holds the top die, if injured by careless driving of keys, etc. In reference to the keys used in holding dies, it will be found that each machine sent out from our

works has its die held by means of a crimped steel key, which is of uniform thickness (not made taper), and which holds the die with an elastic pressure. We recommend the use of this form of key in preference to any other, care being taken to re-bend when they become loose by use. Use of crimped key.

SINGLE UPRIGHT STEAM HAMMERS.

Our steam hammers, with single upright and overhanging cylinder, are all provided with automatic valve gear. We rate these hammers by the weight of the hammer bar in pounds, not in tons. They range in size from 300 pounds up to 2500 pounds.

In our automatic hammers the motion to work the valve has been obtained from a diagonal groove in the upper end of the hammer bar. In early practice this diagonal groove was planed in the flat surface, which surface Mr. Morrison adopted as a means of preventing the bar from turning; but as this slot so made was found to cause a slight tendency to rotate the bar back and forth, it has been abandoned, and inclined grooves, diametrically opposite to each other, are made to work a brass yoke, whose line of vibration is through the central axis of the bar, thus entirely obviating the above objection, and very much increasing the extent of wearing surface, and permitting the guiding of the bar by brass keys in these opposite grooves. The simplicity of the valve motion in all our recent steam hammers recommends its use. Apart from this, we have modified the ports in the steam chest, so as to use a supplemental valve to throttle the exhaust below the piston, without impeding the free exhaust above the piston. This enables the hammer to strike quick, light blows for finishing; in other words, the hammer

Diagonal groove.

Inclined grooves.

Valve motion.

Choking exhaust below piston.

Light quick blows.

can go up as quickly, but in coming down its force may be gauged by the steam cushion upon which it descends, which steam, thus condensed in bulk, re-expands in the up stroke, to the manifest economy of steam used. To fully appreciate the importance of this improvement it must be borne in mind that any attempt to gauge the intensity of the blow by throttling the ingress of steam to the cylinder, slows down its speed and renders its automatic blows irregular without proportionately decreasing their force, as in many cases the weight of the bar alone is too great for the character of work in progress. We cannot too strongly recommend this device, which is placed upon all hammers of 2500 lbs. weight and under, such hammers being more often required to do both light and heavy work than the larger sizes.

Balanced valve.

In explanation of the efficiency of the valve motion as used by us, it must be borne in mind that the easy sliding balanced valve, obtaining its motion from the hammer bar, as above shown, is readily shifted upon the ports by the working lever and the length of stroke varied at will by the operator. In addition to this, if the working lever be moved by hand, in such a manner as to accord in time with the automatic

Hand lever.

stroke, the force of the blow is intensified to the extent of following the hammer bar down to the work with a full port open below for exhaust, and a full port for ingress of steam open above; in other words, the full force of the steam acts down through the entire stroke, adding to the weight of the bar the force

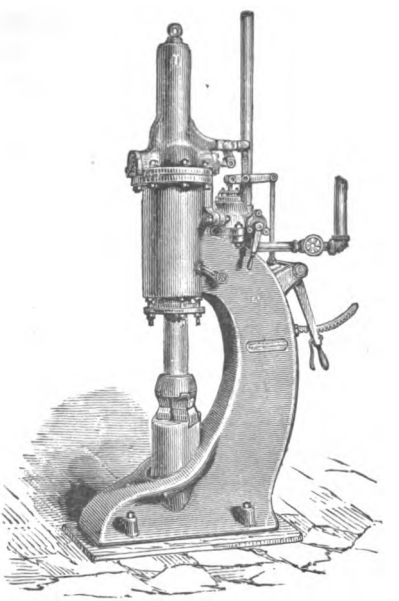
Steam on top of piston.

of the steam, at whatever pressure it may be carried, acting over the whole piston area. It must be manifest to the most casual observer that the hammer bar as used in these hammers, in one solid mass of wrought

iron, must be better adapted to the use of this steam force, to drive it down, than are those hammers in which a cast iron "tup," or hammer head, sliding in side guides, is raised by means of a piston rod and piston attached to its upper end, and in which the down pressure of steam can only be exerted through the comparatively small diameter of piston rod.

A slow motion of the working lever will permit a corresponding slow raising of the hammer and its slow descent, with a squeezing force upon the work, so that it permits its advantageous use as a squeezer for bending and holding work between the dies. In short, the valve motion with the one working lever enables the workman to have as perfect control of the rapidity, force, and character of the blow as is possible with a hammer held in his hand and controlled by his will. Hammers up to and including 2500 pounds weight of ram are made with one upright only; those of 1000 pounds and under are so made as to inclose in their base the top of the anvil block, which block rests on a separate foundation, and thus relieves the frame from shock.

FIG. 2.



DOUBLE UPRIGHT STEAM HAMMERS.

All of our steam hammers over 2500 pounds weight of hammer bar are rated by their weight of hammer bar expressed in tons of 2000 pounds, the smallest size being 1¾ tons weight. These are all made with double uprights, spread wide apart, affording ample room for easy manipulation on the part of the workman. The cylinder is securely bolted between these uprights, which, from their peculiar form, act as efficient braces to hold the cylinder firmly in position. The valve chest is placed on the side of cylinder, allowing the crane to swing up close to it, without any possibility of striking the valve gear. The working boy stands upon the floor level, not on a raised platform, thus enabling him to more certainly gauge the height of blow. In these double upright hammers the valve motion is not automatic, it having been found that hand-working hammers are more convenient for the use to which they are applied. The uprights of the hammers are each made in two parts, the division being at the top of the straight portion of upright, where the arch to the cylinder springs from, and between these parts we interpose an elastic medium. The uprights are bolted to extended foundation plates, these plates in turn resting on and being secured to the foundations, with an intervening layer of timber to give more elasticity. The anvil block rests on a separate foundation, with layers of wood under it for the same purpose. In reference to weight of anvil block, it is usual to make its weight, when used for hammering iron only, about five times the nominal weight of hammer; thus, for a 2-ton hammer, the anvil block should not weigh less than ten tons; but,

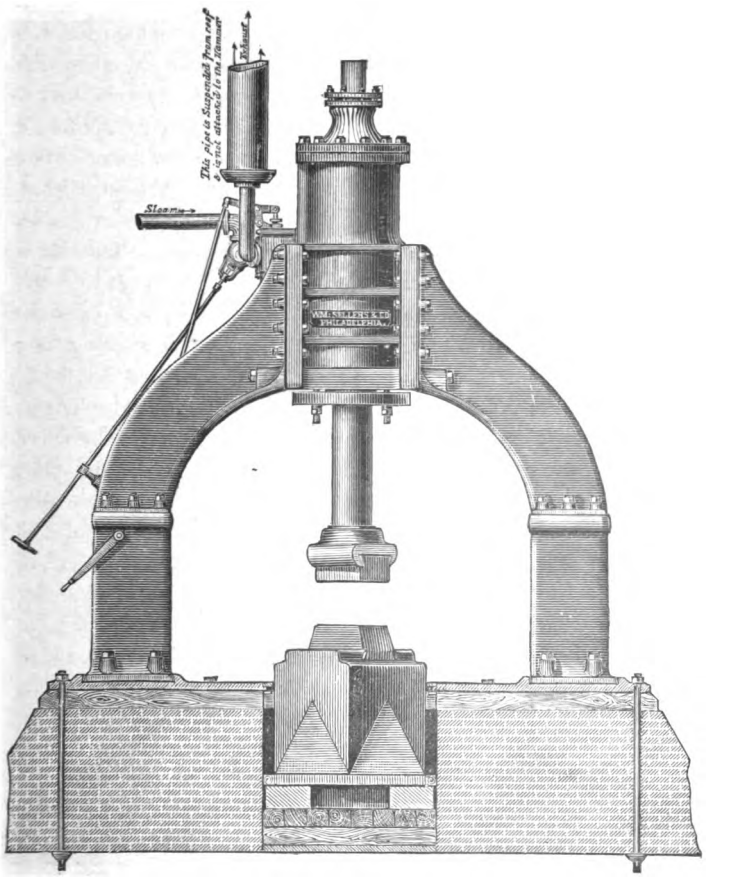
Valve chest back of cylinder.

By hand only.

Foundation plates.

Anvil.

FIG. 3.



DOUBLE UPRIGHT STEAM HAMMER.

when used for hammering steel, it has been found advantageous to make the anvil block heavier,—say from eight to ten times the weight of the hammer. It is not essential that this extra weight be obtained in one solid block; it is as well to add weight by placing under the regular anvil block a wide-spreading under plate of the requisite additional weight.

Nominal weight.

In speaking of the nominal weight of these hammers, it must be borne in mind that we rate our hammers by the actual weight of the hammer bar, not by the force of the blow. It is necessary to note this, inasmuch as some makers rate their hammers by some assumed force of blow they are presumed to be capable of striking. Thus, our 1¾-ton hammer has a hammer bar weighing 1¾ tons. We do not indicate what its force of blow is,—such force being dependent upon many considerations, such as thickness of work being acted on, softness of material, and pressure of steam. We emphasize this, because this difference in mode of rating leads to wrong conclusions on the part of inquirers, who may think the price of our 1¾-ton hammer high, as compared to the price of some other makers' 1¾-ton hammer, which, in point of fact, may be a 300-pound hammer, striking, it is assumed, a 1¾-ton blow.

Steel hammer bar.

When hammers are to be used on very heavy or severe work, such as involved in some of the ingot chipping, etc., in Bessemer works, we recommend a steel hammer bar in place of the wrought iron one. When we furnish the steel bar, the piston is then not made in one piece with the bar, but it is attached to it in so secure a manner as to entirely preclude a possibility of it shifting in use.

Many of our hammers have been furnished with a

dome or cap over the upper end of the hammer bar, this dome being part of the top cylinder head, the intention of the dome being to do away with any packing about the upper end of bar and to permit the steam to act over the entire area of the piston on the down stroke. But as these domes have sometimes broken loose from the head from the vibrations of the frame, we now make all our double upright hammers without this dome, providing a stuffing box at the upper cylinder head and allowing the bar to project through and be seen above the cylinder. We find this gives entire satisfaction; and in this connection it may be well to note that in some cases of special work we have made our single upright hammers hand acting only, and with the bar projecting through the top cylinder head in the manner just stated.

No dome to top head.

Small hammers hand acting.

We would call attention to some of the very important improvements we have made, which, while mentioned in the foregoing pages, should yet be dwelt on. We have very much improved the method of securing the frames or upright to the cylinder. We pass steel bolts through from frame to frame at the lower end of the cylinder, and we arrange these bolts so as to have a free circulation of air about them to diminish their elongation from heat. We make the casting of the frames near to the cylinder with very stiff braces where the bolts take hold. The frame or upright on each side of the cylinder is now made in two parts, the division being made at or near to the point where there is the need of the most elasticity, and between the upper and lower ends of the uprights we interpose layers of wood to permit some motion under the strains coming from foul blows. This construction diminishes the cost of repairs. The frame

Securing frames to the cylinder.

Upright in two parts.

Upright in box form.

is now made in box form in place of ribs and web of the I beam type. The valve chest is placed to one side of the cylinder, directly over one of the uprights.

Cranes.

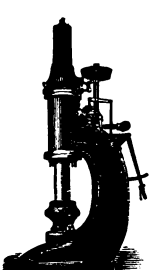
This permits cranes to swing up to the cylinder on either side of the hammer. All steam hammers are submitted to severe strains, some of which cause violent side vibration, and it is to provide against the danger arising from these strains that we have instituted experiments which have led to our recent improvements. It is very important to insure a free

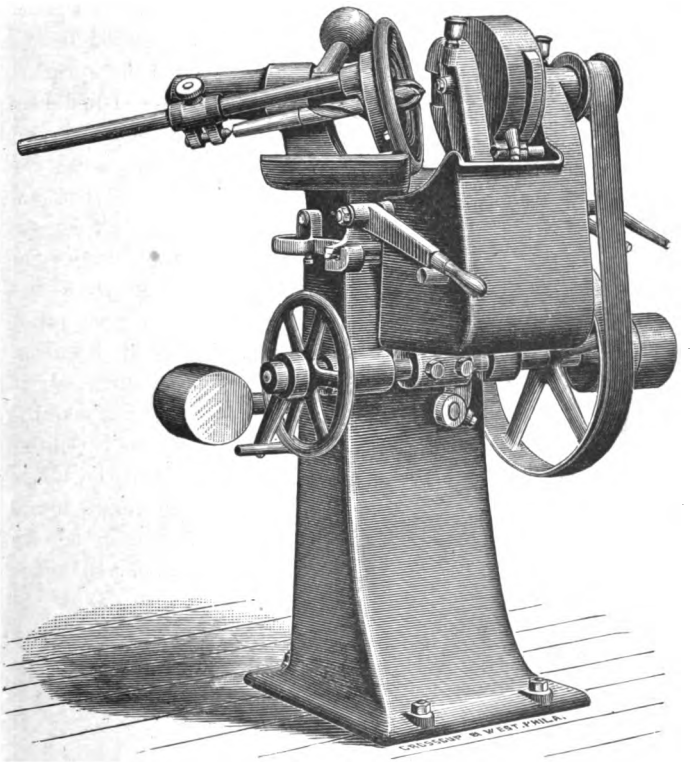
Exhaust pipe.

escape for the exhaust steam. Long exhaust pipes, passing up through the roof of the building and attached to the hammer, are submitted to great strain from the shaking of the hammer and tend to choke the

Collin's Patent exhaust.

exhaust. We furnish all our hammers with Collin's Patent exhaust. In this system the exhaust passage terminates close to the steam-valve and passes into a larger pipe dependent from the roof, but in no way connected with the hammer, the condensed water flowing back in the large pipe or thrown out of the cylinder at the starting of the hammer falls into a pan attached to and near the end of the exhaust pipe or nozzle of the hammer and from thence is carried off by drain pipe.





WILLIAM SELLERS & CO.'S PATENT DRILL-GRINDING MACHINE.

1st. Holds in the same chuck and in precisely the same manner all kinds of drills, either flat or twist, from one-quarter inch in diameter up to two inches, without requiring any bushings.

2d. It grinds the proper amount of clearance to every part of the cutting edge of the lips. This is theoretically correct on a small drill as well as on a large one.

3d. The lips of the drill form the index to fix the cutting edges in the chuck. This method of placing and of holding the drill insures each lip being ground with the same length of cutting edge.

4th. Adjustable to any angle of drill-point, from 90 to 130 degrees included angle.

WM. SELLERS & CO.,

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Die Internationale Jury
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für Werkzeugmaschinen
DIE HÖCHSTE AUSZEICHNUNG
DAS EHREN-DIPLOM
ZUERKANNT.
Der Präs. der K. Ausstell. Comm..

Wien, Der Gen.-Dir.
18. Aug. 1873.

VIENNA 1873

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